



THE FRONT PAGE

KSC's front door to Business Development and Research and Technology

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Center Planning and Development (CPD) is the "front door" for partnerships with NASA's John F. Kennedy Space Center (KSC).

We are developing the world's premier spaceport for government and commercial space industries using comprehensive resource planning and partnerships.

For more information about CPD, visit <http://kscpartnerships.ksc.nasa.gov/>.

Center's cohesive hard work brings in new year

The year 2014 was a landmark year for Center Planning and Development, or CPD, thanks to an extremely hard-working, dedicated workforce across the center. Created in 2010 after the NASA Authorization Act categorized Kennedy as a "multi-user launch complex for government and commercial operations," CPD continues to strive to meet the challenges associated with Kennedy's transformational change.

Since its inception four years ago, CPD has assisted 102 partners with the 2014 active agreements tallying at 49. Many agreements are generated from these partnerships whether the partner serves as the primary or is part of an umbrella agreement.

Our most notable 2014 partnership triumphs were the Property Agreement with SpaceX for use of Launch Pad 39A, and a draft Use Permit allowing Space Florida to manage the Shuttle Landing Facility. In addition, we have future potential to transfer the operation and maintenance of KSC roads and bridges outside of our secure perimeter to the Florida Department of Transportation. All of these collaborations have greatly impacted Kennedy.

In an attempt to reach a broader spectrum of potential partners, CPD regularly collaborates with Brevard County's Economic Development Commission of Florida's Space Coast for promotion of KSC unused facilities, endorsement of NASA KSC Engineering and Technology capabilities, partnership development discussions, industry recruitment initiatives and consultations.

With CPD leadership, the center also played a major part in the completion of KSC's 20-year Web-based Master Plan. Keeping in mind that

KEA-121: CPD Update

10 to 11 a.m., Jan. 27; KSC Training Auditorium

Kennedy is evolving into a multi-user spaceport, our core strategies in creating the KSC Master Plan included Supporting NASA Mission and Programs; Divesting without Diminishing; and Going Leaner and Greener. Several internal and external outreach efforts were held to promote the KSC Master Plan to include meetings with local and state government officials, residents from neighboring counties, local city planners, the Governor's Task Force and Brevard County League of Cities.

Also in the spotlight, our Research and Technology Management Office received the R&D 100 Award for a chemochromic sensor in a tape that can detect hydrogen leaks by changing color. This prestigious award that recognizes the top 100 most technologically significant products developed during the year. It has honored past technologies that include the automated teller machine (1973), fax machine (1975), and high definition television (1998). Additionally, the office received recognition by the Johnson Space Center Inventions and Contributions Board for the creation of the Habitat Demonstration Unit to be used for NASA's planned venture to an asteroid or other deep-space destinations. In the area of U.S. patents, the group received one patent each for Self-healing Wire Insulation, Thermal Insulation Test Apparatus (Dryostat-100), Hypergol Detection Tape, Broadband Light Spectrometer Calibrator and two for Wire

Damage Detection and Rerouting System.

CPD always recognizes the importance of partnership development and will continue to assess customer satisfaction through continued improvement efforts. In 2014, CPD hosted three Partnership Landscape Forums, where we met with current partners and discussed ongoing partnerships and plans for the center's future. We also participated in the center-wide Innovation Expo, allowing 20 of our partners to meet and greet KSC personnel and other partners. Last year we hosted our first Agency Partnership Benchmarking event consisting of 25 participants from nine centers and three component facilities. Discussions centered on Lessons Learned and best practices associated with the current state of all NASA centers and their partnership development efforts. A CPD roundtable was organized and included a broad stakeholder community of existing and former retired space industry subject matter experts and political leaders. They discussed KSC's continual evolution to a multi-user spaceport. On an agency level, Kennedy hosted the annual Agency Master Planning, Cultural Resources, and Real Property Face-to-Face meetings.

As we welcome the new year, CPD will present a CPD Update via a KEA on Jan. 27 from 10 to 11 a.m. at the Training Auditorium.

CPD remains grateful and humbled by the cohesive hard work of the Kennedy team. We will continue to strive to transform Kennedy as we serve as the "front door" for Kennedy partnerships.

-- Scott Colloredo
Director, Center Planning and Development



Coupled Florida East Coast Railway, or FEC, locomotives No. 433 and No. 428 pass the Vehicle Assembly Building at Kennedy Space Center on their way to NASA's Locomotive Maintenance Facility.

KSC on board for potential rail partnership

The KSC Center Planning and Development, or CPD, Directorate is leading the center's partnership development efforts to transition Kennedy to a multi-user spaceport. One of the potential partnerships is with the Canaveral Port Authority (CPA), Kennedy's neighbor at Port Canaveral, who desires rail connectivity to the Florida East Coast Railway (FEC) mainline to ship cargo across the country.

"CPD is leading the development of a potential partnership with CPA to extend rail to the port through KSC," said Scott Colloredo, director of Center Planning and Development, "and the rail vibration study is an important milestone. The study is expected to take up to two years to complete."

Development of an environmental impact statement (EIS) on Kennedy property is underway by the U.S. Department of Transportation Surface Transportation Board (STB). Data collection began Sept. 25 with a rail vibration test in the Launch Complex 39 area to ensure that future railroad operations will not affect launch

"CPD is working with the Canaveral Port Authority toward a potential partnership to extend rail to the port through KSC,"

Scott Colloredo,
director of Center Planning
and Development

vehicle processing. Seismic sensors were placed at strategic locations throughout the complex to collect amplitude, frequency and vibration data, utilizing two coupled FEC locomotives that traversed on Kennedy rail track past facilities at speeds of 10 to 15 mph.

Previously, the CPA partnered with Kennedy's CPD Directorate and other agencies on a preliminary study in 2013 to determine the feasibility of extending rail through Kennedy

to the port. The study included a boots-on-the-ground site survey, site planning, and working with the environmental community to mitigate the effect on scrub jays and other wildlife in the area. The study was completed at the end of 2013 and concluded that it is feasible to extend KSC's existing rail line to the port. Development of the EIS is the next step in the evaluation process.

If KSC decides to enter into an agreement with the CPA based on the findings of the EIS, a two-year permitting, design and construction process would follow with a late 2018 operational date. The port is expected to run up to three, 100-car trains a week at night, with bulk and containerized cargo containers, giving a significant boost to the Space Coast economy.

The center would migrate from an owner/operator of rail to an owner/customer to support the shipment of the Space Launch System's solid rocket boosters and other flight hardware onto the center across the NASA Railroad's Jay Jay Bridge, north of Titusville.

Innovation Expo shines bright light on even brighter future

The drive by Kennedy Space Center to operate as a multi-user spaceport instead of a government-only launch site is on the cusp of producing a location capable of housing an aerospace company that could manufacture, process, launch and recover its spacecraft without leaving the fence line, said Scott Colloredo, director of Kennedy's Center Planning and Development directorate.

Speaking during the Innovation Expo at Kennedy, Colloredo noted that the innovation under way at Kennedy is on a grand scale. Three years after the retirement of the space shuttle fleet, Kennedy has a detailed and diverse master plan that has been approved throughout the agency. The innovative aspects of the plan are arrangements that encourage commercial companies or other entities to use Kennedy's unique resources whether they be facilities or work force or both.

"The master plan allows Kennedy to provide the whole gamut of capabilities companies want in areas where they can grow," Colloredo said. "The master plan first supports the Space Launch System, Orion, and GSDO, but also allows growth in commercial partnerships beyond our primary missions."



Janet Petro, deputy director of NASA's Kennedy Space Center in Florida, discusses transformation during the center's Innovation Expo. Photo credit: NASA/Jim Grossmann

Kennedy is leading the agency in finding a direction that allows NASA to complete its missions at a time when commercial aerospace industries are gaining what they need to take on more prominent roles according to Janet Petro, Kennedy Space Center's deputy director.

"Transformation takes innovative ideas," Petro said. "We can't go about making partnerships in the same ways of the past. The innovation and innovative ideas are driving our transformation."

The expo, which took place inside the Mission Briefing Room at the Neil Armstrong Operations

and Checkout Building, featured numerous center partners including the University of Central Florida, The Boeing Company, Diversified Industries, and partners in NASA's Technology Transfer Program.

Partnerships are seen as vital to bringing the vision of the master plan to life. A number have already been formed recently covering facilities from launch pads to office buildings, processing halls and laboratories. Other partnerships are deep in negotiations such as for the use and operation of the Shuttle Landing Facility.

"The partnerships have made this whole effort a success at the

center," said Tom Engler, deputy director of the Center Planning and Development directorate. "It was seemingly a little slow at the beginning but that was because a lot of companies were laying the groundwork for where they wanted to go. All the partnerships we've had have all been innovative one way or another. It's been a lot of fun watching this all come together."

The center expects to soon ask industry and potential partners for ways to use some of the land at Kennedy, Colloredo said. Any suggestions will need to be in line with the master plan's allotment of the center's 144,000 acres, most of which is a nature preserve.

"Center Planning and Development provides the business development function for Kennedy Space Center, which keeps Kennedy relevant and at the forefront of NASA and commercial spaceflight," Colloredo said. "We have the assets and pretty soon virtually all the infrastructure formerly used for shuttle support will be partnered with a company or state entity."

The development effort at Kennedy comes at a time when other states also are envisioning spaceports of their own to attract high-tech companies in emerging industries such as space tourism. A pattern has emerged that shows small companies tend to begin companies in the West where they can build and fly prototype launchers before coming to Kennedy to launch missions into orbit.

"Originally it was more of an uphill battle," Colloredo said. "Now it seems like partners and potential partners are really on the cusp of coming to Kennedy and there is quite a few of them. Generally what we're seeing is as they become more of an operational provider, they want to migrate toward Kennedy. So that's what we're getting ourselves ready for."



Vendors discuss innovative applications with Kelvin Manning, associate director of NASA's Kennedy Space Center, during the Innovation Expo. Photo credit: NASA/Jim Grossmann

By Steven Siceloff

Innovation Team Honored with Silver Achievement Medals

Innovation is fueling projects to explore new horizons and establish a multi-user spaceport for both government and industry at Kennedy Space Center. A group of space center employees recently was honored for outstanding achievements in developing innovative technologies for the agency's future.

During a ceremony on Oct. 21, Dr. Jay Falker, Space Technology Mission Directorate (STMD) program executive for the Center Innovation Fund (CIF) and NASA Innovative Advanced Concepts (NIAC) Programs, awarded NASA Agency Silver Achievement Medals to 66 scientists and engineers and Kennedy Group Achievement Awards to 16 project support staff for their contributions to the CIF program. Their efforts resulted in Kennedy ranking best of all ten centers from the NASA Headquarters assessment of the CIF annual report.

"The Center Innovation Fund provided through STMD is important for NASA because it encourages employees to take the initiative in developing innovative technological concepts to help meet the needs of future NASA missions," said Kennedy's Chief Technologist Karen Thompson. "We strongly encourage employees to work with collaborative partners from other NASA centers, other government agencies, industry and academia for proposals submitted for CIF."

For many years, the Florida spaceport has emphasized partnerships in research and technology programs and has



Kennedy Space Center Chief Technologist Karen Thompson, center, and Nancy Zeitlin, Space Technology Mission Directorate Technology Integration manager, right, accepted on behalf of the center a NASA Silver Achievement Medal and certificate. Dr. Jay Falker, Space Technology Mission Directorate program executive for the Center Innovation Fund and NASA Innovative Advanced Concepts Programs, left, awarded NASA Agency Silver Achievement Medals to 66 scientists and engineers and Kennedy Group Achievement Awards to 16 project support staff for their contributions to the CIF program. Photo credit: NASA/Kim Shiflett

been recognized throughout NASA and externally for excellent collaborations. For the past two fiscal years Kennedy has more than doubled the amount of CIF-provided funding through leveraged partnerships with external collaborators as well as from other NASA programs that recognized the potential of the proposed innovative technologies, if successful, in enabling future missions.

Working with external partners allows employees from Kennedy and the partner organizations to learn from one another and to develop technologies that can be infused into NASA missions as well as providing other benefits, including commercial applications.

The results of efforts to develop new technologies were compiled in an annual report and delivered to the CIF Pro-

gram during December 2013. The report documented the 14 CIF Projects technical merit, innovation, relevance and value to NASA and the nation. These efforts executed during fiscal year 2013, were praised for their collaborations, partnerships and technology advancement.

The reports from all 10 centers were assessed by a diverse NASA headquarters management review team. Specific feedback regarding the report and impressions of Kennedy's CIF program were provided in May 2014.

"Our reviewers unanimously agreed that the fiscal year 2013 Kennedy report documented the best CIF program management and results across all ten NASA Centers," Falker said. "Your report was well-written, clearly organized, appropriately detailed and truly inspiring to

read. In short, this report describes a terrific program that embodies the spirit of CIF innovation."

"The NASA Headquarters recognition for Kennedy's CIF program is due to the team contributions of the scientists, engineers and project support staff who execute the projects to develop truly innovative technologies," said Carolyn Mizell, Kennedy's deputy chief technologist and manager of the Research and Technology Management Office.

Thompson and Nancy Zeitlin, STMD Technology Integration manager, accepted on behalf of the center a framed replica of the NASA Silver Achievement Medal certificate.

By Bob Granath

MOON EXPRESS TESTS COMPACT LUNAR LANDER

NASA is working with U.S. industry to develop the capabilities and cutting-edge technologies that will help send astronauts beyond low-Earth orbit. To achieve this goal, space travelers will need the resources to survive during long-duration missions to an asteroid, Mars and other outer planets.

Moon Express Inc., of Moffett Field, California, is one of three companies selected for the agency's new Lunar Cargo Transportation and Landing by Soft Touchdown (CATALYST) initiative to advance lander capabilities that will enable delivery of payloads to the surface of the moon.

Moon Express will base its operations at Kennedy Space Center in Florida, and is using facilities and the automated landing and hazard avoidance technology, or ALHAT field at the Shuttle Landing Facility, to perform its initial lander test development.

"Having Moon Express at Kennedy is yet another cornerstone moment in the transformation of the center to becoming a multi-user spaceport," said Tom Engler, deputy director of Center Planning and Development. "A facility used by NASA's Morpheus prototype lander will now be used by a commercial company."

The Moon Express team has

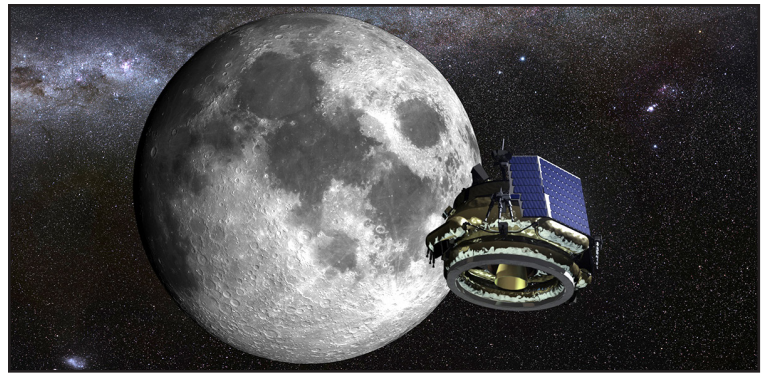
been busy since October preparing the test vehicle, called MTV-1X, for a series of tests. The compact vehicle is the size of a large coffee table. The version of this vehicle that will fly in space is a single-stage spacecraft that uses hydrogen peroxide as a primary fuel in a bi-propellant propulsion system bolstered by kerosene for its Earth departure and moon arrival burns. It's also powered by solar energy, which makes it a very green vehicle.

Activity at the ALHAT field

began in December. The team transported the spacecraft out to the ALHAT pad and was able to pressurize the tanks up to 110 percent of maximum expected operating pressure (MEOP). This critical milestone checked out the control systems and cleared the way for future testing at MEOP.

"NASA has been a wonderful partner," said Bob Richards, Moon Express founder and CEO. "We're working beside the Morpheus team to build and test our own vehicle at Kennedy."

Richards said they will use entre-



An artist illustration of the Moon Express MX-1 lunar lander on its mission to the moon. Image Credit: Courtesy of Moon Express Inc.

preneurial and innovative ways to become the first private company to reach the moon within two years. The plan is to launch the lunar lander spacecraft, called MX-1, as a secondary payload on a maiden

technology demonstration flight in 2016 on a mission to the moon.

"We want to unlock not just the mysteries, but the resources of the moon to benefit all humanity," Richards said. "We're preparing to live off the land on the moon, because there's water there."

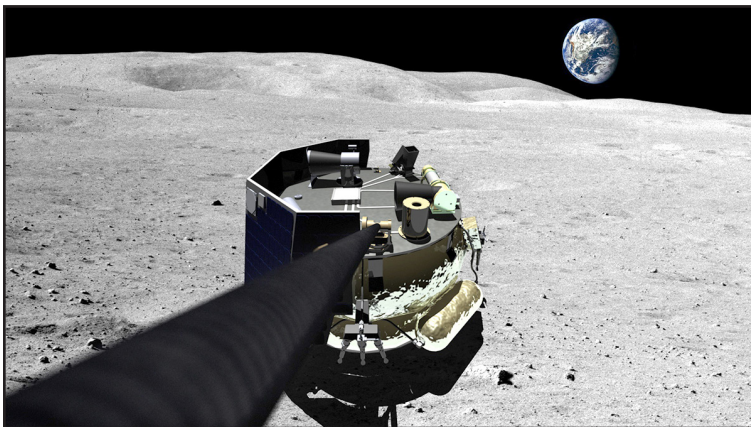
The Moon Express lunar lander could be used to deliver commercial and government payloads to the moon.

This year, the vehicle's guidance, navigation, control and operation will be checked during initial testing. According to Moon Express president Andy Aldrin, the team will use a crane to hover the vehicle and move it around at the ALHAT field to capture the vehicle milestone process. A series of tethered landing tests will be performed until enough confidence is established in vehicle control to do a free flight.

Early next year, another set of tests will occur. The same test vehicle will be used, with added hydrogen peroxide thrusters, a star tracker and some of the navigation controls that will be used on the actual flight vehicle.



Bob Richards, co-founder and chief executive officer of Moon Express Inc., of Moffett Field, California, speaks to the media Nov. 3 at Kennedy Space Center's Shuttle Landing Facility. Photo credit: NASA/Ben Smegelsky



An artist illustration of the Moon Express MX-1 lunar lander on the surface of the moon. Image Credit: Courtesy of Moon Express Inc.

Later in the year, more flight-like versions of the test vehicle will be built, called MTV-2 and MTV-3, which will utilize a unique fuel tank called a toroidal tank, which is shaped like a doughnut and will be installed on the vehicle and tested to determine how the fuel behaves as it swirls around in the tank. Aldrin said the advantage of a tank shaped like this is the vehicle can be packaged into a very compact spacecraft that holds a lot of propellant.

If testing goes well, the actual composite fuel tank will be added to the vehicle for further testing at the ALHAT field. At the hangar, the GNC software and some of the flight avionics are being prepared for flight vehicle testing.

"We want to support the exciting commercial innovations that come from partnerships like this one with Moon Express," Engler said.

"One day we'll learn how to use water on the moon to make the rocket fuel we need, to make the economics of all the resources on the moon viable," Richards said.

The Advanced Exploration Systems Division of NASA's Human Exploration and Operations Mission Directorate manages the Lunar CATALYST initiative as part of its Lander Technologies Project. The project is led by Marshall Space Flight Center in Huntsville, Alabama, but includes all of the NASA centers to support the partnership.

By Linda Herridge

AS 'SCENE' ON CENTER



Photos courtesy of Robert "Bob" Freeman

While visiting Kennedy Space Center, former astronaut Buzz Aldrin spent time at the Project Morpheus hazard field at Kennedy's Shuttle Landing Facility, where he viewed the future NASA lander prototype, Morpheus, and the RASSOR (Regolith Advanced Surface Systems Operations Robot), a small and robust excavation robot designed for acquiring regolith (planetary soil).

For more about the RASSOR (Regolith Advanced Surface Systems Operations Robot), go to <http://www.nasa.gov/topics/technology/features/RASSOR.html>.
For more about Project Morpheus, go to <http://morpheuslander.jsc.nasa.gov/>.



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